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EXAMINER

KNAUSS, SCOTT A

ART UNIT

PAPER NUMBER

2874

DATE MAILED: 06/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/044,461

Applicant(s)

TODA ET AL.

Examiner

Scott A Knauss

Art Unit

2874

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 06 May 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) 13-22,25 and 26 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 3-12 and 27 is/are allowed.
- 6) ☒ Claim(s) 1,2,23 and 24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Election/Restrictions***

2. Applicant's election without traverse of Species A, claims 1-12,23,24 and 27 in Paper No. 7 is acknowledged. Claims 13-22,25 and 26 are withdrawn from further consideration by the examiner.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 07-140455 (Kashimoto).

Regarding claim 1, Kashimoto discloses in figs. 1 and 2 a switching element comprising:

incident light #208, being polarized by polarizing plate #207 (see translation [0029]) and thus having a specific polarized light component, and is made incident on an optical waveguide #3 (see fig. 1)

the light being selectively emergent from the waveguide #3 (pixel electrode #10 and liquid crystal layer #203 control the emergence of light, see [0011]), the switching element comprising:

A multilayer structure comprising a plurality of light transmissive layers #2,#3,#4,#7,#9,#10.

Kashimoto discloses that a light transmissive layer, in this case waveguide layer #3 has a higher refractive index than a layer #4 (see [0036] where it is stated that layer #3 has a higher refractive index than layer #2 and [0037] where it is stated that layer #4 is made of the same material having the same refractive index as layer #2). Further, it is apparent from fig. 1 that layer #4 is light transmissive, allowing light to pass through to an emergence portion.

Kashimoto does not, however disclose whether the refractive index of layer #3 is different from the refractive index of layer #4 by  $3\sigma$  or more,  $\sigma$  being the refractive index control accuracy at the time of producing the multilayer structure.

Nevertheless, it is well known in the art to surround a waveguiding (core) region with cladding regions, such as the regions #2,#4 disclosed by Kashimoto, such that the cladding regions have a refractive index significantly lower than the core for the purpose of confining light to the core region to efficiently propagate light through the waveguide. Furthermore, the applicant has disclosed in the specification in [0043] that a difference in refractive index of from about 0.05 to 0.15 largely exceeds  $3\sigma$ . Such a refractive index difference is well known in the art, and is used to confine light to a core region of a waveguide.

Therefore it would have been obvious to one of ordinary skill in the art to modify the switching element of Kashimoto to provide a core region #3 which has a refractive index significantly higher, in this case more than  $3\sigma$  higher than regions #2,#4, for the purpose of confining light to the core region of the waveguide.

Regarding claim 2, the layer #4 has a different refractive index from the layer #3.

6. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 3,918,794 (Milton)

Regarding claim 23, Milton discloses an optical switch in fig. 2 for making part of an incident light #7, which has a specific polarized light component (see col. 2, lines 42-46, where Milton specified that light of one polarization is switched) and has been made incident on an optical waveguide (rod #12, which may include a reflective cladding (col. 2, lines 8-11) and thus can be considered to be a waveguide), selectively emergent from the waveguide 12 to a light emergence portion #22 provided outside the optical waveguide, the switch comprising:

a light transmissive stacked structure (comprised of layers #12, #14, and #22) including a function layer (liquid crystal layer #14) for selective emergence of the incident light

Milton does not explicitly specify the thickness of the waveguide #12 relative to the length of the function layer #14, although it appears that the function layer length is more than 3 times the thickness of waveguide #12. Milton does not, however disclose the thickness of the waveguide being between 1/5 and 1/20 of the length of the function layer.

Nevertheless, Milton discloses that the switch in fig. 2 is used to couple out a fraction of light propagating from the left of waveguide #12 (see col. 3, lines 3-6) in to waveguide #22. It is well known in the art to increase the amount of light coupled between two waveguides by increasing the length of the coupling region, and it is clear that by increasing the length of function layer #14 and the length of waveguide #22 in contact with the function layer, a greater portion of light can be coupled out into the upper waveguide.

Therefore it would have been obvious to one of ordinary skill in the art to increase the function layer length beyond 5 times the thickness of the waveguide, for the purpose of increasing the amount of light that is coupled to the upper waveguide #22. Furthermore, it has been held that, where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 24, Milton, as modified, discloses the claimed invention except for a length of the function layer being  $1,000 \pm 300$  microns. Nevertheless, it would have been obvious to one of ordinary skill in the art to select such a value, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

### ***Allowable Subject Matter***

7. Claims 3-12 and 27 are allowed. Regarding claims 3 and 27 in particular, the prior art fails to teach or suggest an optical switch for making polarized light selectively emergent from a waveguide having a light transmissive stacked structure including a function layer for selective emergence of light, wherein letting  $\Delta n$  be a difference between a refractive index  $n_0$  of said optical waveguide and a refractive index  $n_1$  of an arbitrary layer forming part of said stacked structure, "d" be a thickness of said arbitrary layer, and  $\lambda$  be a wavelength of said incident light, the values of  $\Delta n$ , "d", and  $\lambda$  satisfy a condition of

$$2.20 \times 10^{-3} \leq |\Delta n * d * \lambda^{-1}| \leq 3.03 \times 10^{-3}$$

$$\text{OR } |\Delta n * d * \lambda^{-1}| \leq 3.03 \times 10^{-3} \text{ and } |\Delta n * d * \lambda^{-1}| \neq 0.$$

### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

JP 57-142622 (Kawachi) discloses in figs. 4 and 5 a particularly relevant switch for switching a polarized light component out of a waveguide using liquid crystal.

US 3,838,908 (Channin) discloses another switch in fig. 17 using liquid crystal to switch polarized light out of a waveguide.

US 6,111,633 (Albert et al) discloses another type of switch using prisms instead of waveguides, and a plurality of light transmissive layers.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A Knauss whose telephone number is (703) 305-5043. The examiner can normally be reached on 9-6 Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (703) 308 - 4819. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0530.

Scott Knauss

Art Unit 2874

sak  
May 20, 2003

  
HEMANG SANGHAVI  
PRIMARY EXAMINER